CHAPTER 50

Management of Common Dislocations

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Joint dislocations are frequently encountered among patients presenting to the emergency department (ED). They can range from a simple finger injury to limb- or life-threatening consequences of high-energy trauma. Although the dislocated joint is most often clinically obvious, the presentation may be obscure or masked by other injuries. Emergency clinicians must be capable of detecting and managing these injuries; appropriate timely referral to a consultant is generally required for complex dislocation injuries.

This chapter addresses the diagnosis and management of joint dislocations. Keys to the clinical assessment and radiographic evaluation of these injuries are discussed along with methods of reduction. The emphasis of the chapter is on simple dislocations that should be diagnosed and generally managed in the ED. Fracture-dislocations that commonly require operative intervention and emergency orthopedic consultation are not discussed.

PREPARATION OF THE PATIENT

Although many authors claim their reduction method is well tolerated without premedication, they generally have not quantitatively measured the discomfort of their patients.[1–5] There are no rigid generally accepted guidelines for the use of pharmacologic adjuncts in the management of dislocations. Each patient and presentation is unique and the treating clinician must use judgment as to whether premedication is required, which agent or agents to use, and what dose to give. *In general, the editors suggest the judicious use of analgesia/sedation for the majority of reductions performed in the ED.* The calm, cooperative patient may tolerate gentle reduction attempts of a major joint such as the shoulder, but even the most stoic of patients may be quite uncomfortable with the manipulations necessary for reduction of a dislocated finger. A radial head dislocation in a child is usually easily accomplished without analgesia; however, the reduction of a hip dislocation is rarely successful without a significant amount of anesthesia/analgesia. Attempting any reduction technique in an extremely anxious patient without premedication will generally frustrate the operator and further upset the patient, and it may hinder a successful outcome. When multiple attempts are required, and significant force must be exerted due to muscle spasm or an uncooperative patient, there is additional chance of producing complications during the reduction.

Verbal techniques for alleviating anxiety and discomfort are not to be discounted as they can be of great assistance during joint reduction. In field settings, simple hypnosis techniques have been successfully used for major joint dislocations.[6] In the ED, verbal reassurance and distracting conversation are useful adjuncts.

In most circumstances, analgesia or sedation of some sort, or both, will be required; generally the intravenous (IV) route for drug administration is the method of choice, as it allows for rapid relief of patient discomfort and facilitates repetitive dosing for titration to the desired effect. Chapter 34 provides an in-depth discussion of procedural sedation and analgesia for a wide variety of ED procedures, including joint reduction. Alternatives to procedural sedation and analgesia include intra-articular injection of lidocaine, hematoma blocks (see Chapter 30), peripheral nerve blocks (see Chapter 32), and regional anesthesia (see Chapter 33).

GENERAL PRINCIPLES

The clinical assessment of the patient with a dislocation must include a search for other injuries, especially if the mechanism was of high energy. This is generally most important for hip, knee, and posterior sternoclavicular dislocations. For all dislocations, a detailed extremity neurovascular examination should be conducted and appropriately documented prior to focusing attention on the injured joint.

Although many dislocations are clinically obvious, some may escape detection for some time while other injuries or issues dominate the clinical picture. A knee dislocation may be quite obvious in a 170-pound man who displays a deformity of the knee, but in a 400-pound obese patient, the knee may look deceivingly normal on first glance. The history and mechanism of injury can be quite helpful in certain circumstances. For example, a painful shoulder joint in a seizure patient should prompt assessment for a posterior shoulder dislocation, whereas a history of the knee striking the dashboard will clue one to the potential for a hip dislocation. Some dislocations will have been reduced prior to clinician assessment. A careful history will uncover these injuries and prompt the necessary assessment of the ligamentous integrity of the joint and guide proper immobilization and follow-up care. A dislocated, then spontaneously reduced, knee has escaped detection by even the seasoned clinician's initial evaluation. Other dislocations that commonly present in a reduced state include finger dislocations, knee dislocations, patellar dislocations, and radial head subluxations.

Although the chance of a gentle reduction attempt causing a fracture or neurovascular injury is extremely low, *careful evaluations before and after reduction, as well as documentation of the neurovascular status, are prudent.* Often the initial pain of the dislocation is distracting, and paresthesias or a weak pulse may not be readily apparent until the joint has been replaced. When the integrity of the pulse is in question, the blood pressure at the wrist or foot may be compared to the uninjured extremity, or a pulse oximeter may be applied to the distal fingers (Fig. 50–1). *Prereduction radiographs of dislocated joints are generally recommended.* Reasons for this include the difficulty in distinguishing a fracture—dislocation by clinical examination and the potential for medicolegal problems if the fracture is not identified prior to reduction attempts. More important, certain associated fractures predict a poor outcome from closed reduction and make orthopedic consultation a consideration prior to such attempts. The obvious exceptions to this rule include suspected radial head subluxation in young children, clinical circumstances in which radiographs are not readily available (e.g., in the wilderness), minimally symptomatic patients with recurrent shoulder dislocations with a history of minor to no trauma, and clinical conditions (i.e., vascular compromise or

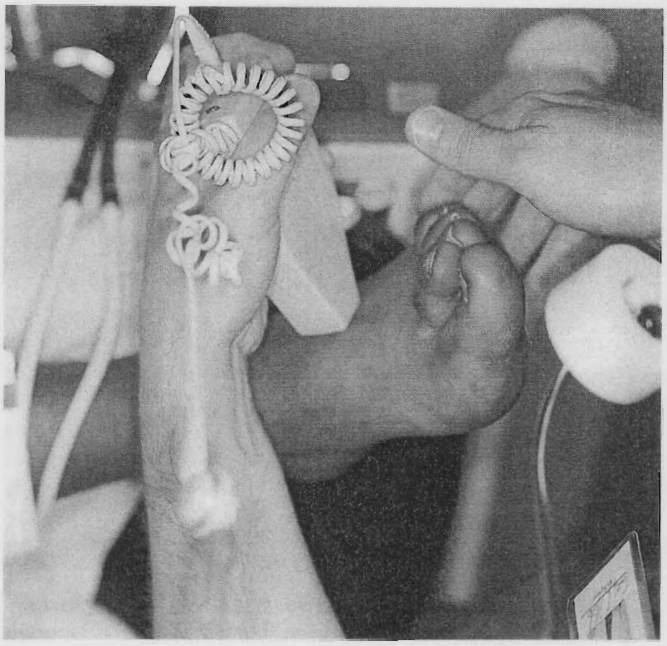


FIGURE 50–1. Significant vascular injuries from dislocations, such as the knee, are usually obvious, but some reduction in distal circulation may be subtle due to partial vascular compromise that heralds subsequent ischemia. The standard techniques to assess vascular injury are assessing the strength of the pulse and capillary refill, but other techniques may be helpful. While these procedures are neither well studied nor quantified, taking the blood pressure distal to the injury with a cuff and Doppler (shown here) or applying a pulse oximeter distal to the injury and comparing the results to the uninjured extremity may give some helpful clues to underlying vascular injuries. Calculating a brachial/ankle blood pressure index (see Chapter 1) is also more accurate than simple palpation.

threatened skin penetration) that dictate the need for immediate reduction. Some also question the need for prereduction films in certain patients with anterior shoulder dislocations.[7,8] *The editors strongly suggest postreduction films in virtually all patients who have had a dislocation reduced in the ED.* Although postreduction radiographs are traditionally obtained, the need for this in a clinically obvious successful shoulder joint relocation also has been questioned.[8,9] Although postreduction films are often not clinically useful and may not be cost-effective, they are recommended as prudent clinical practice and for medicolegal purposes.

Patients who have received sedatives and opioids may not remember the actual successful reduction or the immediate postreduction period. A reinjury after release from the ED without radiographic corroboration of a successful reduction can raise questions about the adequacy of the initial procedure. Occasionally a fracture is detected on postreduction radiographs that was not obvious on the initial films, or a previously noted minor fracture may be found to reside in an intra-articular location.

The proper terminology for dislocations describes the relationship of the distal (or displaced) segment relative to the proximal bone or the normal anatomic structure. The terms *anterior* and *posterior* are used in most dislocations. Therefore, if the head of the humerus lies anterior to the glenoid fossa, the injury is an *anterior shoulder dislocation*. Similarly, if the olecranon lies behind the distal end of the humerus, the injury is a *posterior elbow dislocation*. In the hand, wrist, and foot, one uses the terms *dorsal* and *volar*. *Palmar* and *plantar* are sometimes used in place of volar to describe the position of the dislocated part. Dislocations can be open or closed and may have associated fractures requiring separate description.

It is generally accepted that the sooner a dislocation is reduced, the better. This alleviates the patient's discomfort and corrects the distortion of surrounding soft tissue structures. In some studies the success rate of relocation (reduction) is higher when attempted closer to the time of injury.[2] However, there is no reason to forego an attempt at a closed reduction due to "old injuries" in the vast majority of dislocations. Chronic dislocations of several days, weeks, or more are often difficult to reduce in a closed manner, but such presentations are infrequent.

General points about the reduction itself include the need for patience on the operator's part and the avoidance of excessive or abrupt applications of force. Gentle and gradual application of the various reduction techniques lessen the risk of complications. The operator must clearly understand the technique to be applied, and one should not hesitate to review a description of the procedure on a regular basis. Review of the technique is most important for uncommon dislocations, but it is a good habit even for the more common dislocations performed by seasoned clinicians.

A certain percentage of all types of dislocations are not amenable to closed reduction. Inability to complete a closed reduction is generally a result of the interposition of soft tissue structures or fracture fragments and not necessarily due to improper technique. If one has achieved sedation/analgesia adequate to permit relaxation of the patient's muscle tone, reduction should be relatively straightforward. When reduction under adequate sedation/analgesia is unsuccessful, multiple attempts at closed reduction are inappropriate. Generally, orthopedic consultation should be considered after two failed attempts.

Once an attempt at reduction is completed, the operator should recheck the neurovascular status that was documented before the reduction was performed. For the elbow, hand, and forefoot joints, passive range of motion is performed to assess the stability of the reduction and to ensure a smoothly gliding joint that is free of intra-articular obstruction. In addition to close monitoring of the medicated patient, proper aftercare involves adequate immobilization of the injured joint for comfort and to prevent repeat dislocation. Recommendations for follow-up care are dependent on the injury and its severity.

Timing of Reductions

Questions often arise concerning the necessity of immediate reduction vs delayed reduction, with the clinician fearing disastrous neurovascular consequence if a dislocation is not manipulated immediately upon arrival. In reality, there is rarely an instance where some prereduction radiographs, even portable films, cannot be obtained prior to treatment. Even if the pulse is weak, or the fingers are numb, a few minutes' delay is usually acceptable in order to gain important radiographic information on the type of fracture and for documentation for the follow-up clinicians. Important clinical information may be difficult to obtain or the specific initial injury may be impossible to reconstruct once the joint has been reduced (Fig. 50–2). Of equal importance, dislocation with concomitant neurovascular injuries should be reduced with the least amount of trauma possible, often requiring a

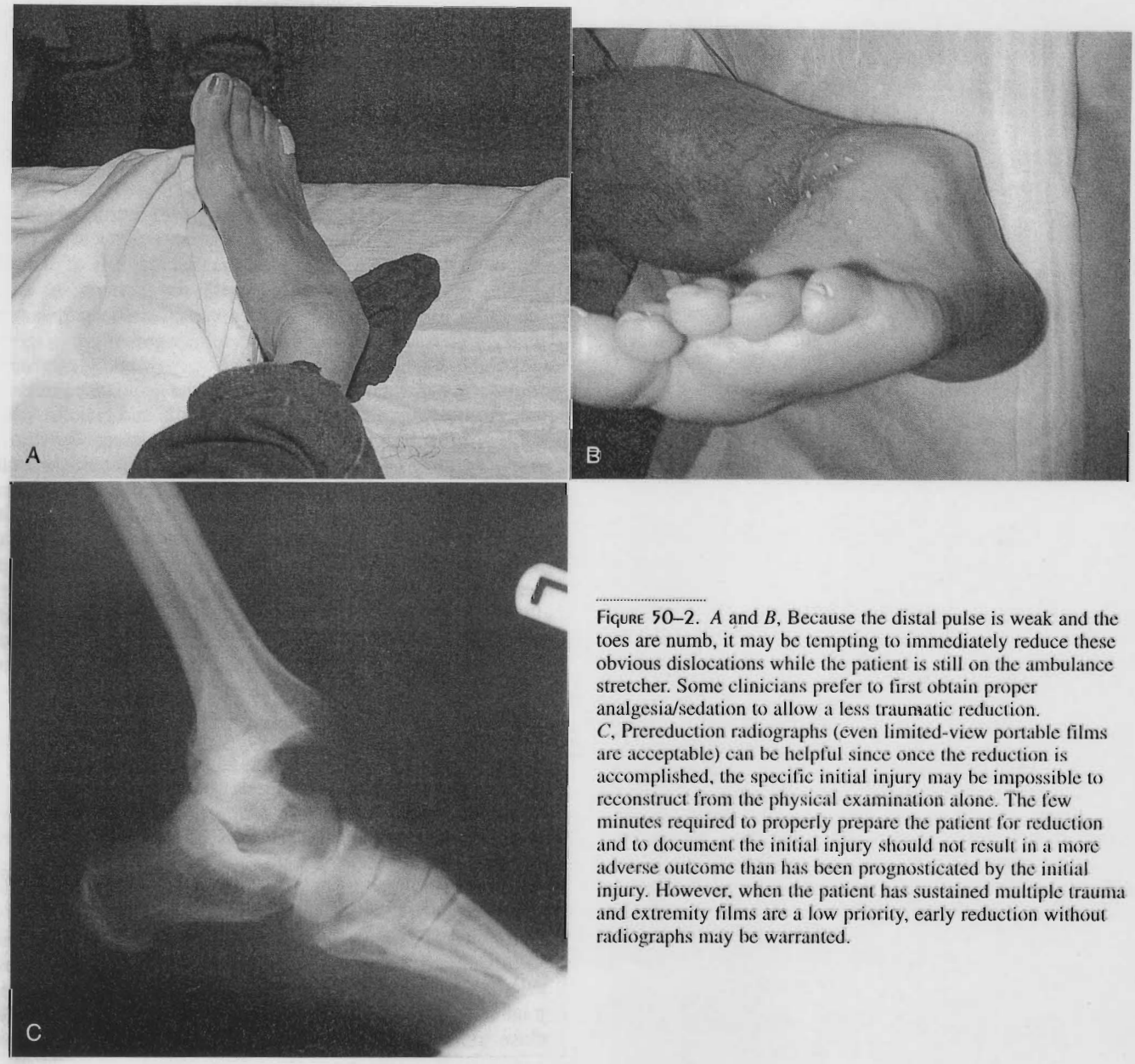


FIGURE 50–2. *A* and *B*, Because the distal pulse is weak and the toes are numb, it may be tempting to immediately reduce these obvious dislocations while the patient is still on the ambulance stretcher. Some clinicians prefer to first obtain proper analgesia/sedation to allow a less traumatic reduction. *C*, Prereduction radiographs (even limited-view portable films are acceptable) can be helpful since once the reduction is accomplished, the specific initial injury may be impossible to reconstruct from the physical examination alone. The few minutes required to properly prepare the patient for reduction and to document the initial injury should not result in a more adverse outcome than has been prognosticated by the initial injury. However, when the patient has sustained multiple trauma and extremity films are a low priority, early reduction without radiographs may be warranted.

few minutes for the induction of analgesia/sedation, a time during which radiographs can be obtained. *If a vascular or neurologic abnormality is documented prior to reduction, the joint should be reduced by the most timely and least traumatic procedure available.* Each case should be handled individually, considering the specific injury, available resources, and experience of the clinician. Although multiple unsuccessful or forceful attempts at reduction in the ED should be avoided with all dislocations, this is especially important if there is vascular or neurologic compromise. Occasionally, the more prudent course is reduction under general anesthesia, but this decision must be analyzed given the availability of consultation and other resources.

This chapter covers dislocations of the various joints with the exception of wrist dislocations, which are complex and require orthopedic consultation, and temporomandibular joint dislocations, which are discussed in Chapter 65. Assessment and management principles, including reduction methods, are presented and aftercare is discussed.

SHOULDER DISLOCATIONS

The human shoulder joint is remarkable for its degree of possible motion. The anatomic features that allow for this mobility, however, contribute to its instability. The glenohumeral joint has the greatest range of motion of any joint in the body, largely due to the loose joint capsule and the shallow nature of the glenoid fossa.[10] Posterior dislocation is uncommon, largely due to the anatomic support of the scapula and the thick muscular support in this area. The anterior support is less pronounced, with the inferior glenohumeral ligament serving as the primary restraint to anterior dislocation.[11] The depth of the glenoid fossa is somewhat increased by the fibrocartilaginous glenoid labrum, which forms the rim of this structure.

Most shoulder dislocations are anterior (i.e., the humeral head becomes situated in front of the glenoid fossa). Posterior dislocations are the next most common, but they generally account for less than 4% of shoulder dislocations.[12]

Uncommon variations include inferior (luxatio erecta), superior, and intrathoracic dislocations. Dislocations of all types, including the shoulder, are less common in children due to the relative weakness of the epiphyseal plate as compared to the ligamentous support of the joint.

Anterior Shoulder Dislocations

Anterior dislocations of the shoulder are the most common major joint dislocation encountered in the ED. The usual mechanism of injury is indirect, with a combination of abduction, extension, and external rotation.[10, 11] Only rarely is the mechanism a direct blow to the posterior aspect of the shoulder. Occasionally, especially with recurrent dislocations, the mechanism is surprisingly minor, such as mere external rotation of the shoulder while rolling over in bed or raising the arm overhead. The occurrence of a first dislocation at a younger age is associated with a higher recurrence rate; 80% to 92% with a first dislocation before age 20 years vs 10% to 15% in patients with a first dislocation after age 40 years.[10] Rotator cuff injuries, however, occur more frequently in older patients with anterior shoulder dislocations.[13]

The 4 types of anterior dislocations are subcoracoid (accounting for >75% of anterior dislocations), subglenoid, and the uncommon subclavicular and intrathoracic.[10] These are classified according to where the humeral head comes to rest (Fig. 50–3).

Clinical Assessment

The presentation of anterior shoulder dislocation is usually obvious (Fig. 50–4). Posterior dislocations are more subtle on both clinical presentation and radiographic manifestations, and can be misdiagnosed as a severe contusion (Table 50–1). The patient supports the injured extremity and leans toward the injured side, holding the arm in *abduction* with slight external rotation. The patient cannot *adduct* or internally rotate the shoulder. Visual inspection reveals loss of the rounded appearance of the shoulder due to the absence of the humeral head beneath the deltoid region. The acromion is prominent and an abrupt drop-off below the acromion can be seen or palpated. An anterior fullness in the subclavicular region is visible in thinner individuals and is easily palpable in most others. Comparison to the uninjured side is a useful aid for both visual examination and palpation. Any attempt at internal rotation is quite painful and is resisted by the patient. The inability to place the palm from the injured extremity on the uninjured shoulder is consistent with anterior shoulder dislocation; postreduction, this maneuver should be possible.

A careful assessment of the neurovascular status of the affected extremity is essential. Injury to the axillary artery is rare, usually occurring in the elderly[13] and can be quickly assessed by palpation of the radial pulse or the presence of an expanding hematoma. It is important to assess the status of the axillary nerve, as this is the most common nerve lesion resulting from anterior dislocations.[14] The sensory component of the axillary nerve is assessed by testing for sensation over the lateral aspect of the upper arm (Fig. 50–5). The motor component of the axillary nerve would be tested by assessing the strength of the deltoid muscle, a difficult undertaking in the patient with a dislocated shoulder. Less commonly, the brachial plexus may be injured by a stretch injury, producing variable nerve deficits. The neurologic examination should include a complete assessment of all major nerves to the arm,

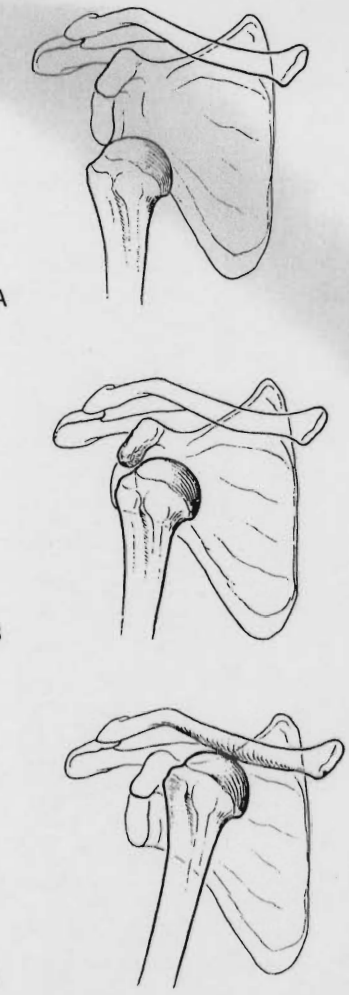


FIGURE 50–3. Types of anterior dislocations. These types of anterior dislocations should receive the same treatment. *A*, Subglenoid dislocation (rare type). *B*, Subcoracoid dislocation (most common type). *C*, Subclavicular dislocation (rare type). (From DePalma AF: Management of Fractures and Dislocations: An Atlas. Philadelphia, WB Saunders, 1970, p 617. Reproduced by permission.)

as other nerve injuries such as to the ulnar and radial nerve may occur.[14] The presence of a neurologic deficit does not preclude closed reduction, *but in the presence of a nerve injury, multiple forceful attempts at reduction should be avoided.* Brachial plexus injuries require an especially atraumatic reduction. If generous sedation/analgesia does not permit an easy reduction in the ED, reduction of the dislocation with a nerve injury may be more prudently performed in the operating room under general anesthesia. Nerve injuries in this setting generally have a good prognosis, but the patient should be informed of the findings and the need for follow-up. Symptoms may require many months to resolve.

The rare vascular injuries, such as axillary artery disruption, are usually quite obvious, producing dysesthesias and coolness of the involved arm. An expanding axillary hematoma, pulse deficit, peripheral cyanosis, and pallor can be seen. Collateral circulation may produce a faint pulse in the extremity, so comparison blood pressure of the uninjured side may be helpful. Specific lesions include complete disruption, linear tears, or thrombus. Axillary artery injuries can occur in all ages, although they are more prominent in the

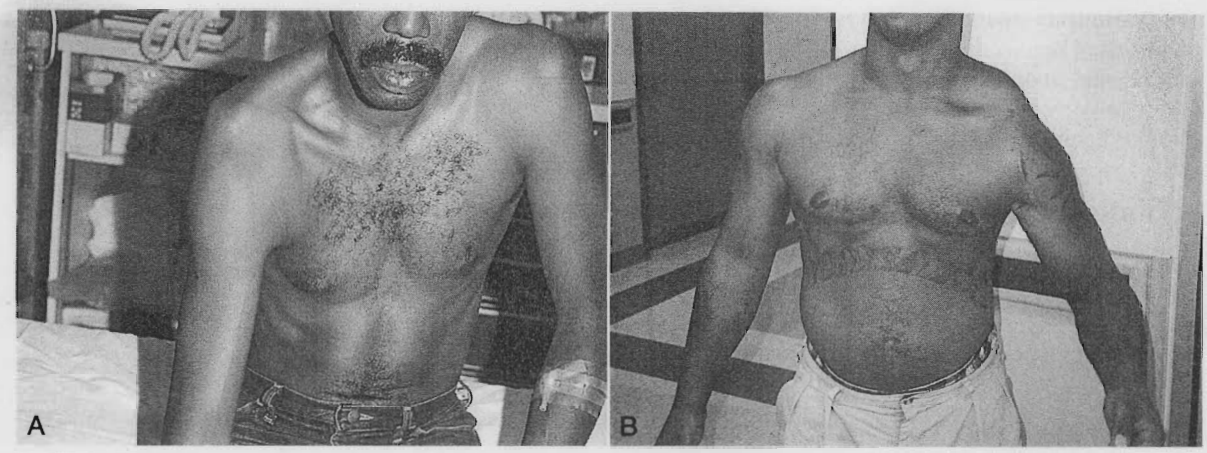


FIGURE 50–4. *A*, Typical presentation of an anterior right shoulder dislocation. The shoulder is very painful; thus, the patient resists movement. The outer round contour of the shoulder is flattened, and the displaced humeral head may be appreciated in the subcoracoid area. Often the patient abducts the arm slightly, bends the torso toward the injured side, and supports the flexed elbow on the injured side with the other hand. *B*, Another example of an obvious left shoulder dislocation. This chronic dislocation occurred frequently with minimal trauma, in this case from rolling over in bed.

elderly. The artery is at risk with anterior dislocations, and a dislocation-spontaneous reduction can produce the injury. Arteriography with surgical repair of the artery is required, occasionally with fasciotomy of the forearm if ischemia is longstanding.[15]

Some portion of the rotator cuff will be injured in many shoulder dislocations. Rotator cuff tears are easier to evaluate after reduction, often days later when pain and swelling have subsided.

Radiologic Examination

Associated fractures are detected in 15% to 35% of anterior shoulder dislocations, with fractures of the greater tuberosity being the most common.[10] The presence of a fracture of the greater tuberosity does not change the initial management of anterior shoulder dislocations, and these fractures usually heal well after closed reduction in the routine fashion.[10] The Hill-Sachs deformity, a sign of repeated dislocations, produces a groove in the posterolateral aspect of the humeral head and may be seen on prereduction or postreduction films (Fig. 50–6). It is caused by impaction of the humeral head against the glenoid rim after dislocation. It rarely has clinical significance, but may result in a loose body within the joint.[13] Impaction of the humeral head against the glenoid during dislocation may cause a disruption of the glenoid rim, known as a "Bankart lesion." This has been implicated as one cause of recurrent dislocations, but does not affect immediate ED management.[13]

Fractures of the humeral neck are frequently displaced with attempts at closed reduction, the result of which is often avascular necrosis of the humeral head.[16] The fact that humeral neck fractures are a known complication of shoulder relocation[10] suggests the value of prereduction radiographs in anterior shoulder dislocations. However, some argue that *clinically obvious recurrent dislocations and clinically obvious anterior dislocations without a blunt trauma injury mechanism* (information usually offered by the patient) can be reduced without prior radiographs, as fracture is quite unlikely in these situations.[7,8]

TABLE 50–1. Comparison of Anterior and Posterior Shoulder Dislocations: Classified According to the Displacement of the Humeral Head

Type of Dislocation	Patient Presentation	Other Clinical Clues	Radiographs
Anterior 99% subcoracoid and subglenoid Humeral head is *anterior* to the glenoid	• Arm held in *abduction* and *slight external rotation* (abduction more prominent in subglenoid dislocation) • Patient cannot adduct or *internally* rotate shoulder	Seen from the front, shoulder appears "squared off" Distal acromion prominent from side view	*On AP view*: obvious dislocation *On lateral or "Y" view*: humeral head appears *anterior* to glenoid fossa
Posterior 95% subacromial 5% subglenoid and subspinous Humeral head is *posterior* to the glenoid	• Arm held in sling position, with adduction and internal rotation • Attempts at *abduction* and *external rotation* cause extreme pain	Coracoid process prominent, glenoid fossa empty anteriorly and humeral head bulging posteriorly	*On AP view*: vacant glenoid sign, 6-mm sign, light bulb sign *On lateral or "Y" view*: humeral head appears *posterior* to glenoid fossa

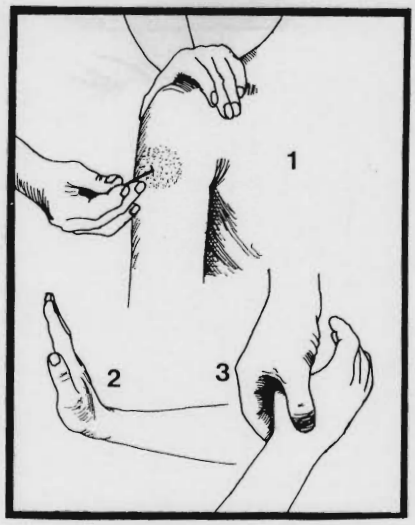


Figure 50–5. Evaluation of the upper extremity with a shoulder dislocation. Axillary (circumflex) nerve palsy is the most common neurologic complication. The axillary nerve has a sensory and motor function. Test the integrity of the nerve by assessing sensation to pin prick *(1)* in its distribution over the "regimental badge" area. (The shoulder is usually too painful to allow assessment of deltoid activity with certainty.) Look for other (rare) involvement of the radial portion of the posterior cord *(2)* and involvement of the axillary artery *(3)*. (From McRae R: Practical Fracture Treatment. Edinburgh, Churchill Livingstone, 1981, p 84. Reproduced by permission.)

Anterior dislocations are not subtle on the routine anteroposterior (AP) radiograph, and this view detects the most important fracture to identify, that of the humeral neck. An adequate AP view, when combined with the typical clinical examination, allows for successful management of most anterior shoulder dislocations. The true AP view of the shoulder is taken at a right angle to the scapula, requiring rotation of the patient to 30 to 45° as shown in Figure 50–7.

The typical lateral views obtained include the scapular Y view (Fig. 50–8), the transthoracic view, and the axillary view. These views rarely add to the AP in the obvious anterior dislocation, but they are of value in *posterior* dislocations. The usefulness of additional views in anterior shoulder dislocations is primarily to detect fractures, and the previously mentioned lateral views (especially the transthoracic view) are quite limited in this respect.[17] The apical oblique view has been found to be more valuable in acute shoulder trauma than the oblique scapular projection.[17] This view is obtained by angling the beam 45° caudad with the patient in a 45° oblique position (Fig. 50–9*A* and *B*).

Postreduction radiographs are obtained to document the success of the reduction. Occasionally they will reveal a fracture not detected on the prereduction radiographs.

Reduction Techniques

Hippocrates (450 B.C.) is generally credited with the first detailed description of reduction techniques, and it is believed that a drawing in the tomb of Upuy (1200 B.C.) is the earliest depiction of such a method.[10] The Hippocratic technique involves placement of the operator's foot in the axilla to effect countertraction. This technique is problematic and is not recommended by recent authors.[3, 11] Likewise, the Kocher method, which involves forceful leverage of the humerus, has an increased rate of complications and is generally discouraged in favor of other techniques.[10, 11]

This section discusses several methods of reduction that are well studied, proven to be safe, and easy to master. Regardless of the reduction technique used, gradual, gentle application of the technique is essential. Although all of the techniques discussed are generally acceptable and many authors state that their techniques are quite painless,[1–5] few studies have quantified the actual pain reported by patients.[18] McNamara found that scapular manipulation was generally well tolerated; 62% of patients not receiving premedication reported no or only mild pain during the reduction.

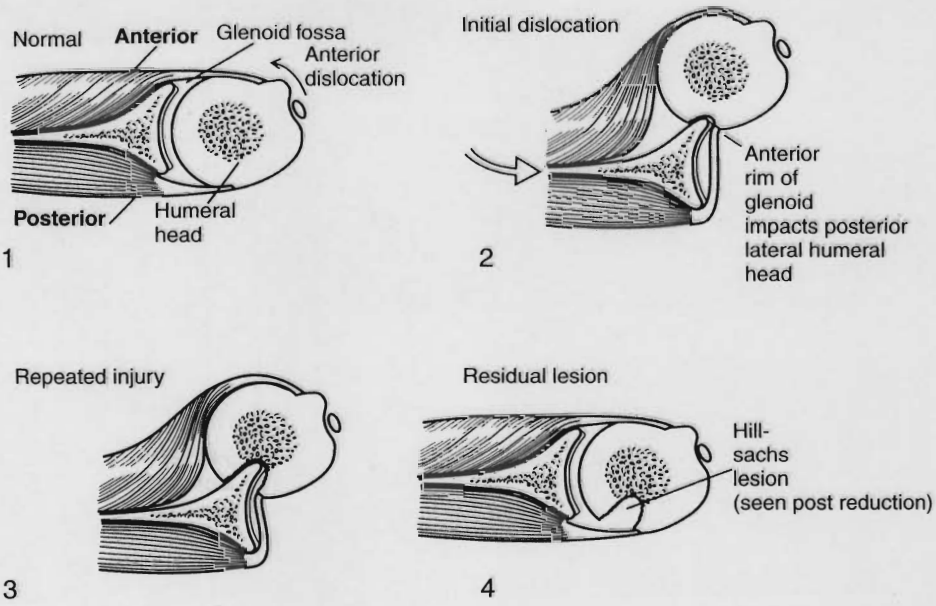


Figure 50–6. With repeated anterior shoulder dislocations, a Hill-Sachs lesion may form. During the dislocation the humeral head is damaged by the sharp anterior rim of the glenoid *(2)*. With repeated dislocation the lesion, called the "hatchet sign" develops *(3)*. On the reduction film the lesion is apparent *(4)*.

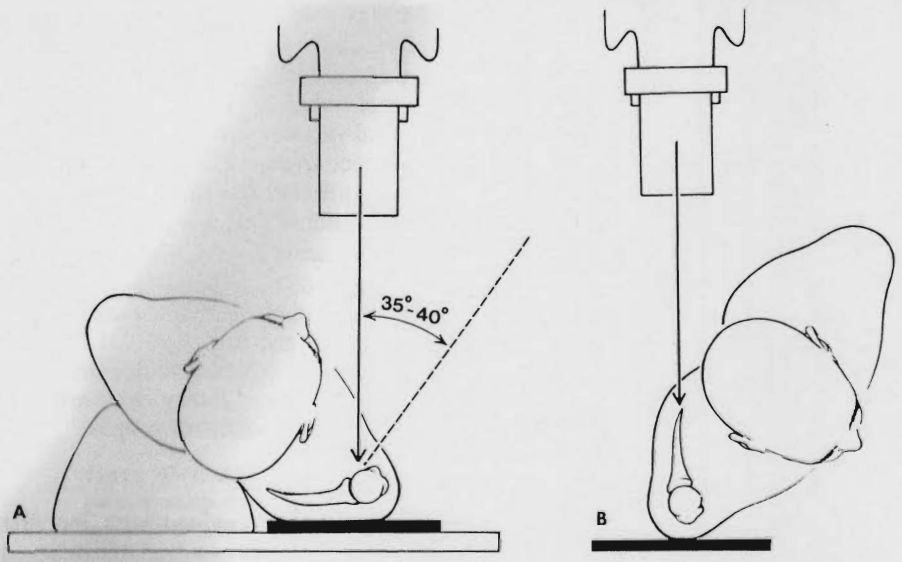


FIGURE 50–7. Trauma series includes two views of the shoulder made perpendicular and parallel to the scapular plane. This provides an anteroposterior (*A*) and a scapular Y (*B*) view. The advantage is that roentgenograms may be obtained without moving the patient or removing the arm from the sling. (From Heppenstall RB: Fracture Treatment and Healing. Philadelphia, WB Saunders, 1980, p 374. Reproduced by permission.)

Additionally, pain ratings were not lessened in the premedicated group.[18] As noted previously, intra-articular lidocaine also may be used to reduce the pain of reduction (Fig. 50–10). In studies by Matthews and Kosnick, the use of intra-articular lidocaine was found to offer significant pain relief during reduction of anterior shoulder dislocations, making it a useful alternative to procedural sedation and analgesia.[19, 20] Note that 10 to 20 mL of 1% lidocaine has been used with the intra-articular technique, and 15 to 20 minutes postinjection is required to expect analgesia. Joint injection does not produce muscle relaxation, but it does obviate the need for intravenous access and prolonged observation. Operator judgment is an important part of the decision as to whether reduction should be attempted without premedication. The advantages of such an approach include the avoidance of potential complications from drug therapy, reduced staff requirements, and theoretically, a more rapid patient disposition. Certainly the patient who is markedly intoxicated may require little if any supplemental

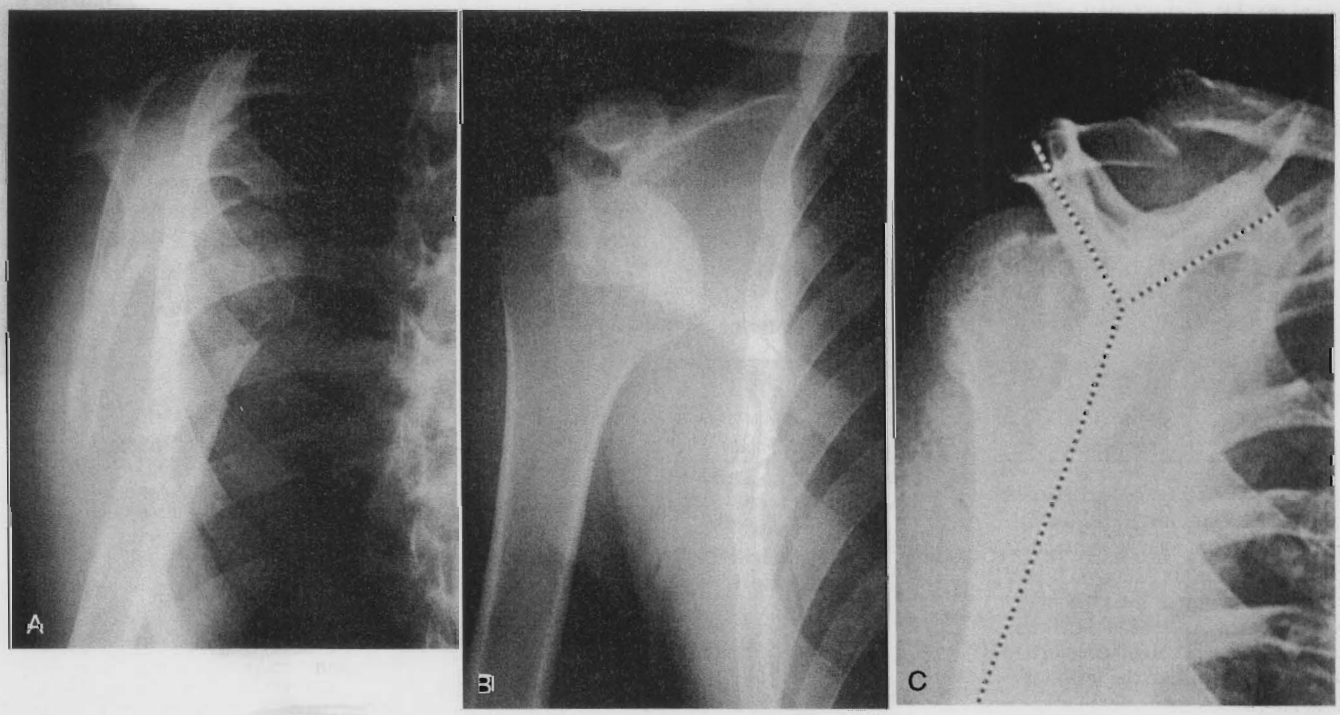


FIGURE 50–8. In the trauma series, a lateral view of the scapula (also called scapular Y view) demonstrates the head of the humerus displaced inferiorly and medially, the most common position for an anterior dislocation *(A)*. An anterior dislocation is shown on the anteroposterior projection *(B)*. A posterior dislocation: Transscapular projection showing the dislocated humeral head, posterior in relationship to the intersecting limbs of the Y *(C)*. (*A* and *B* from Heppenstall RB: Fracture Treatment and Healing. Philadelphia, WB Saunders, 1980, p 392; *C* from Greenbaum E (ed): Radiology of the Emergency Patient. New York, John Wiley & Sons, 1982, p 512.)

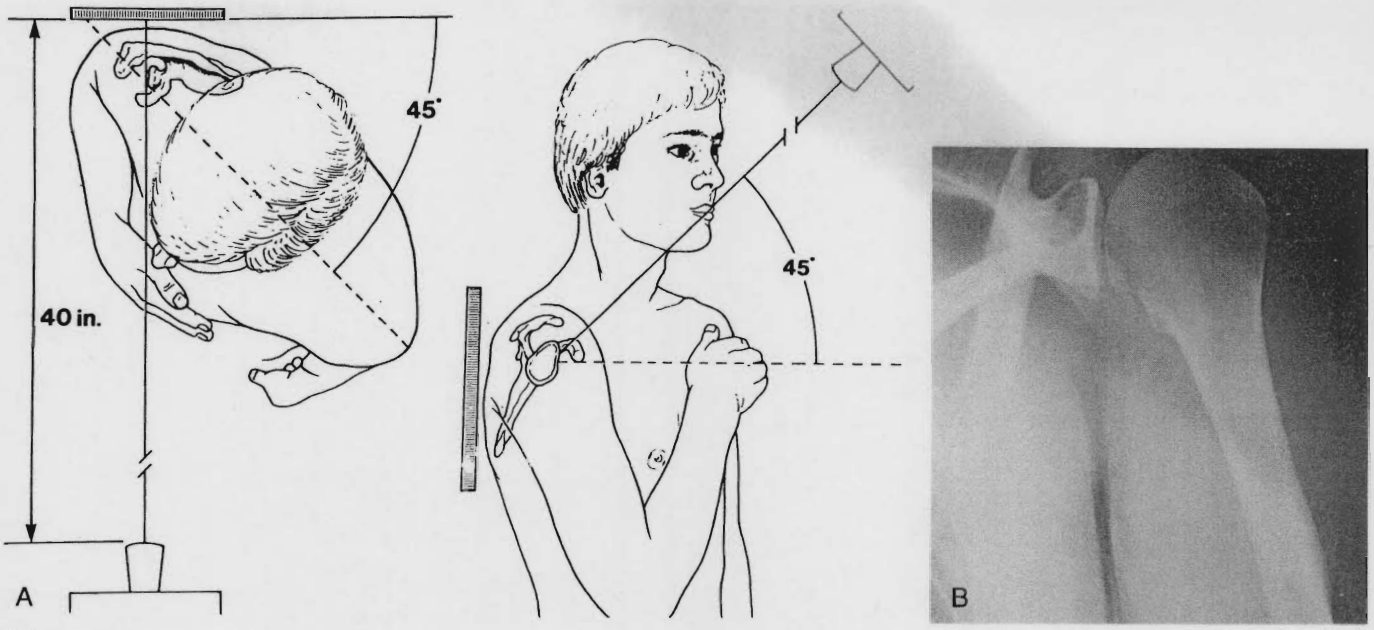


FIGURE 50–9. *A,* Positioning for apical oblique view. The affected shoulder is placed at a 45° oblique position and the central ray is angled 45° caudad. The affected arm is adducted. *B,* Normal apical oblique view. (*A* and *B* from Heppenstall RB: Fracture Treatment and Healing. Philadelphia, WB Saunders, 1980, p 392. Reproduced by permission.)

sedative therapy. However, all patients who are more than mildly anxious or who are reluctant to cooperate with an attempt at reduction without medication, and those with a high degree of muscle spasm, should receive premedication. Generally, only one attempt is made and, if unsuccessful, reduction is attempted with the use of medication. When in doubt, it is best to use pharmacologic adjuncts (see Chapters 30, 33 and 34).

Several factors will help decide which technique is best in each situation. One factor is whether the patient will tolerate a reduction attempt without sedation, as attempts without sedation should not use forceful techniques such as traction-countertraction. The comfort level of the clinician with a given technique is always a factor, as the greatest success rates will likely result from techniques with which the clinician is most familiar. The time and resources available to the clinician must be considered, as methods such as the Stimson maneuver require greater time and the availability of weights and straps. Additionally, certain reduction techniques can be performed without assistance, while others require an additional person to apply countertraction or to help with manipulation of the scapula or humeral head. Ideally, the emergency clinician should become familiar with a number of different techniques for reducing anterior dislocations of the shoulder, as no single method has a 100% success rate nor is any technique ideal in every situation.

Stimson maneuver. The Stimson maneuver (Fig. 50–11) is a classic technique that offers the advantage of not requiring an assistant. The patient is placed prone on an elevated stretcher and about 2.5 to 5.0 kg (5 to 10 lb) of weight is suspended from the wrist.[10, 11] The weights can be strapped to the wrist, or a commercially available Velcro wrist splint can be placed and the weights hung from this with a hook.[21] The slow, steady traction of this method often permits reduction, but it may take 15 to 20 minutes. Reduction may be facilitated by gentle external rotation of the extended arm.

Variations of this method include the recommendation for flexion of the elbow to further relax the biceps tendon and the application of manual traction instead of weights.[22, 23] Rollinson allowed the arm to hang under its own weight after a supraclavicular block and reported a 91% success rate with usually no more than a gentle pull on the arm after 20 minutes in this position.[24] Each variation of the Stimson method can be used in combination with the scapular manipulation technique described later. Indeed, a success rate of 96% has been reported using the combined prone position, hanging weights, IV drug therapy, and scapular manipulation.[21]

Disadvantages of the Stimson method include the time required and the danger of patients slipping off the elevated bed. A "seatbelt" strap or bedsheet may be placed around the patient and stretcher to avoid patient movement off the stretcher. Additionally, a bed that elevates to a suitable height for the patient's arm length, a convenient method to hang the weights, the weights themselves, and adequate staff to monitor the patient are often difficult to locate and organize in a busy ED.

Scapular manipulation technique. This method is popular due to its ease of performance, reported safety, and acceptability to patients. To date, no complications from this technique have been reported in the literature.[18, 21, 25] Shoulder reduction using this method focuses on repositioning the glenoid fossa rather than the humeral head, and it requires less force than other methods.[21] The success rate is high, generally > 90% in experienced hands.[21, 25]

The initial maneuver for scapular manipulation is traction on the arm as it is held in 90° of forward flexion. This may be performed with the patient prone and the arm hanging down as described in the Stimson method, with or without flexion of the elbow to 90° (Fig. 50–12*A*). Alternatively, this traction may be applied by the operator placing an outstretched arm over the seated patient's mid-clavicle while pulling the injured extremity with the other arm (Fig.50–12*B*). Regardless of the

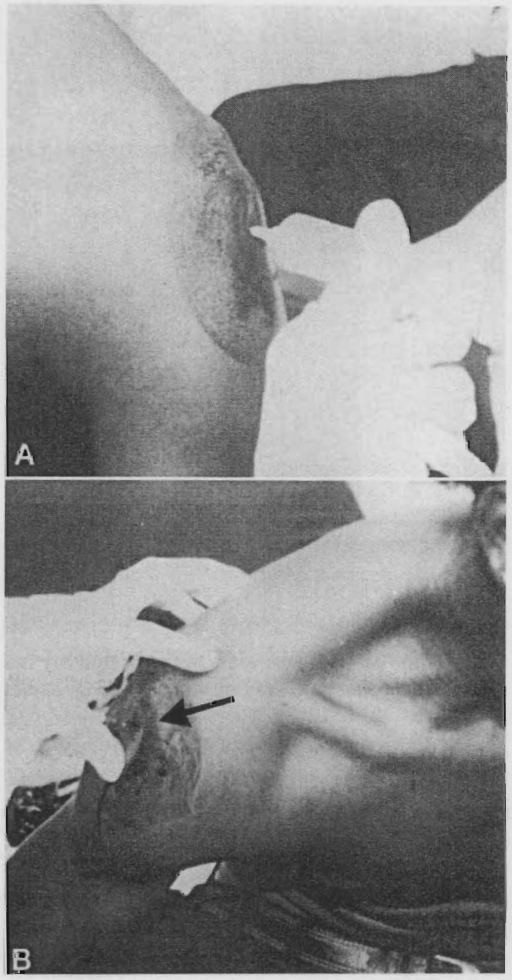


FIGURE 50–10. Intra-articular injection for the reduction of an acute anterior shoulder reduction. *A*, After aspirating blood from the joint, 10 to 20 mL of 1% plain lidocaine is slowly injected through the lateral sulcus, aiming slightly caudad. *B*, Anterior view. Allow 15 to 20 minutes for the lidocaine to take effect. (From Matthews DE, Roberts T: Intraarticular lidocaine versus intravenous analgesic for reduction of acute anterior shoulder dislocations. Am J Sports Med 23:54, 1995. Reproduced by permission).

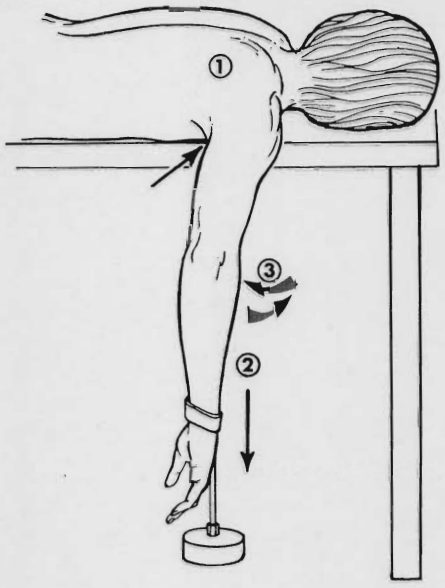


FIGURE 50–11. Stimson technique. This technique is often tried first, because it is the least traumatic if the patient can relax the shoulder muscles. *1*, The patient is lying prone on the edge of the table. One must be careful that the sedated or intoxicated patient does not fall off the table. Belts or sheets can be used to secure the patient to the stretcher. *2*, 5-kg weights are attached to the arm, and the patient maintains this position for 20 to 30 minutes, if necessary. *3*, Occasionally, gentle external and internal rotation of the shoulder with manual traction aids reduction. (From DePalma AF: Management of Fractures and Dislocations: An Atlas. Philadelphia, WB Saunders, 1970, p 618. Reproduced by permission.)

means of arm traction, slight external rotation of the humerus may facilitate reduction by releasing the superior glenohumeral ligament and presenting a favorable profile of the humeral head to the glenoid fossa.[26]

The prone patient position is recommended for those not familiar with the technique, as it facilitates identification of the scapula for manipulation (medial rotation of the tip). Nonetheless, the technique can be performed with the patient supine, given that the patient's shoulder is flexed to 90° and the scapula is exposed during gentle upward traction on the humerus.[27] Although seated scapular manipulation offers the advantage of not requiring the patient to go through the awkward and potentially uncomfortable assumption of the prone position, it is a technically more difficult variation of scapular manipulation. When placing the patient in the prone position it is important to place the injured shoulder over the edge of the bed to allow the arm to hang in a perpendicular manner for the application of traction.[25]

After application of traction, the scapula is then manipulated to complete the reduction. Anderson and coworkers recommend manipulation of the scapula after the patient's arm is relaxed[25]; however, success is possible with no delay in the performance of this second step.[18] Manipulation of the scapula is carried out by stabilizing the superior aspect of the scapula with one hand and pushing the inferior tip of the scapula medially toward the spine (see Fig. 50–12*A*). The thumb of the hand stabilizing the superior aspect of the scapula can be placed along the lateral border of the scapula and used to assist the pressure applied by the thumb of the other hand. A small degree of dorsal displacement of the scapular tip is recommended as it is being pushed as far as possible in the medial direction.[25]

When the patient is properly positioned, with the affected arm hanging in a perpendicular fashion, the lateral border of the scapula may be difficult to find in larger subjects. This border is generally located quite lateral with the patient in this position, and it must be properly located prior to any reduction attempt. The reduction itself is occasionally so subtle that it may be missed by both the patient and the operator. A minor shift of the arm may be the only clue to the successful reduction. Careful palpation of the subclavicular area prior to repositioning the patient may be used to determine the success of the reduction.

External rotation method. This method offers the advantage of requiring only one person and no special equipment. The technique requires no strength or endurance on the part of the operator. Additionally, it has been reported to be well tolerated by patients. The actual pain experienced by patients with this technique has not been quantified, but

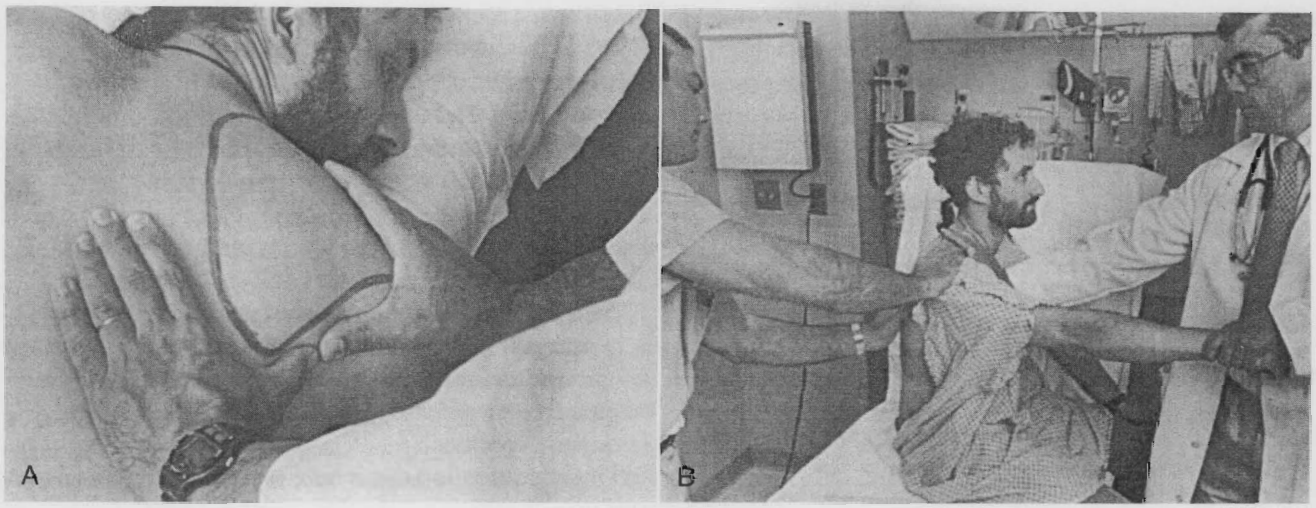


FIGURE 50–12. Scapular manipulation technique. *A,* The inferior tip of the scapula is pushed medially and dorsally with the thumbs while the superior aspect of the scapula is stabilized with the fingers of the superior hand. Weights may be attached to the hand to apply hanging traction. *B,* While the patient is seated, the operator applies traction with one hand and countertraction with the other, while an assistant rotates the scapula in the same manner as in *A*. (From McNamara RM: Reduction of anterior shoulder dislocations by scapular manipulation. Ann Emerg Med 22:1140, 1995. Reproduced by permission.)

Plummer and Clinton state it can be performed with "little, if any sedation."[3]

In this technique the basic maneuver is *slow, gentle* external rotation of the fully adducted arm. In 1957, Parvin described a self-reduction external rotation technique in which the patient sits on a swivel-top chair and grasps a fixed post at waist height and slowly turns the body to enact external rotation. Parvin reported that the reduction usually takes place at 70 to 110° of external rotation.[28]

Since Parvin's initial study, this method has been described with the patient supine and the affected arm adducted tightly to the side of the patient.[1, 29] The elbow is flexed to 90° and held in the adducted position with the operator's hand closest to the patient. The other hand holds the patient's wrist and guides the arm into slow and gentle external rotation (Fig. 50–13). The procedure may require several minutes, because each time the patient experiences pain, the procedure is momentarily halted. Although the report of Mirick and colleagues mentioned using the forearm as "a lever,"[1] a later description clearly recommends allowing the forearm to "fall" under its own weight.[3] No additional force should be applied to the forearm and no traction is exerted on the arm.

The end point of the reduction may be difficult to identify, as reduction is frequently very subtle. It is therefore recommended to continue the external rotation until the forearm is near the coronal plane (lying on the bed, perpendicular to the body), a process that usually takes 5 to 10 minutes.[3] If the patient notes persistent dislocation with full external rotation, steady traction at the elbow may be added at this time. Reduction may occasionally be noted when the arm is rotated back internally.[29] The success rate of this technique in 3 series performed by emergency clinicians was around 80%.[1, 29, 30]

Milch technique. Proponents of this method praise its gentle nature, high success rate, lack of complications, and tolerance by patients.[2, 5] It can be described as "reaching up to pull an apple from a tree." The basic steps of this technique are abduction, external rotation, and gentle traction of the affected arm. Finally, if needed, the humeral head is pushed into the glenoid fossa with the thumb or fingers (Fig. 50–14).

Milch, in describing this technique, wrote that the fully abducted arm was in a natural position in which there was little tension on the muscles of the shoulder girdle.[31] He postulated that this was related to our ancestral "arboreal brachiation" (swinging from trees). The primary step in this technique is to have the affected arm abducted to an overhead position. Russell and coworkers had their patients raise the arm and put the hand behind the head as a first step.[26] Although this seems odd, patients can usually do this quite readily with little assistance and be quite comfortable in this position. Alternatively, the operator may abduct the arm by grasping the patient's arm at the elbow or the wrist. Lacey and Crawford found that the prone position, with the patient's shoulder close to the end of the bed, facilitated this step.[32]

Once the arm is fully abducted, gentle longitudinal traction is applied with slight external rotation. If reduction does not occur quickly, the humeral head can be pushed upward into the glenoid fossa using the thumb or fingers of the other hand. Beattie and associates reported a success rate of 70% with the Milch technique,[2] but others report success rates of ≥ 90%.[5, 26]

Traction-countertraction. This method is commonly used in the ED, largely out of tradition, as it has a high rate of success and many emergency clinicians are most comfortable with it. Familiarity is an advantage of this technique, but it requires more than one operator, some degree of force, and, occasionally, endurance. This technique is usually quite uncomfortable for the patient, and premedication is recommended prior to any attempt.

With the patient supine, a sheet or strap is wrapped around the upper chest and under the axilla of the affected shoulder (Fig. 50–15). An assistant holds this sheet so as to apply the countertraction. The operator's foot should *not* be used in the axilla to provide countertraction. Traction may then be applied to the extended arm, but this generally results in operator fatigue, especially if the operator relies on biceps

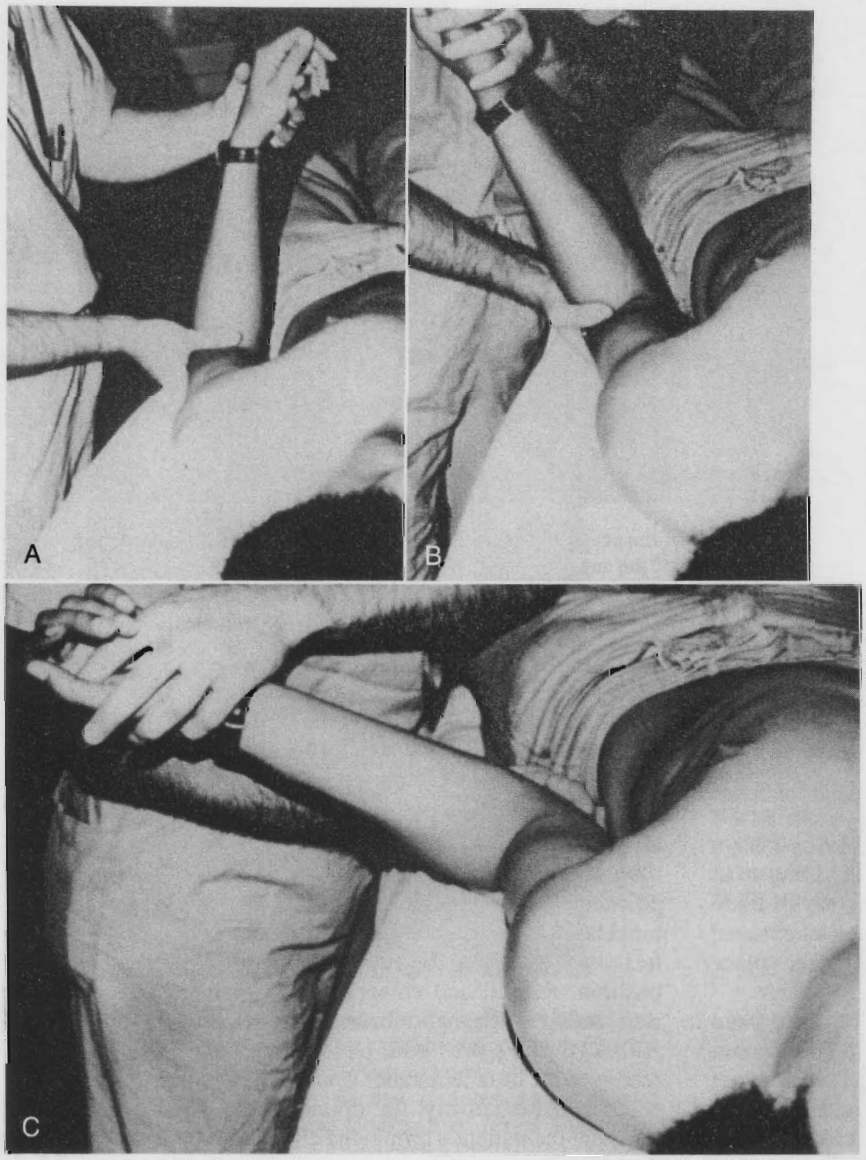
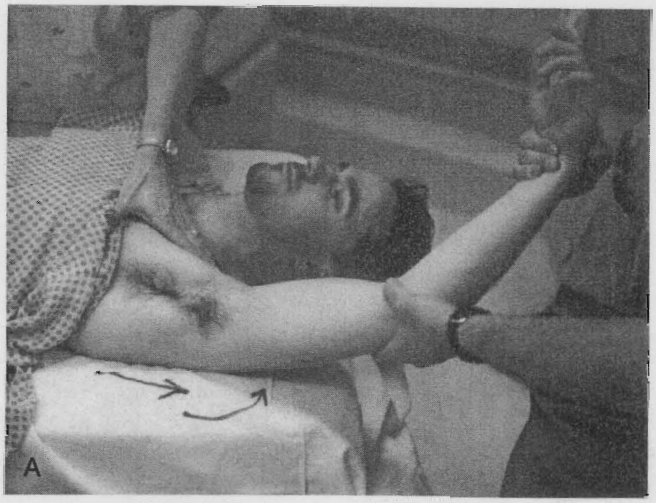


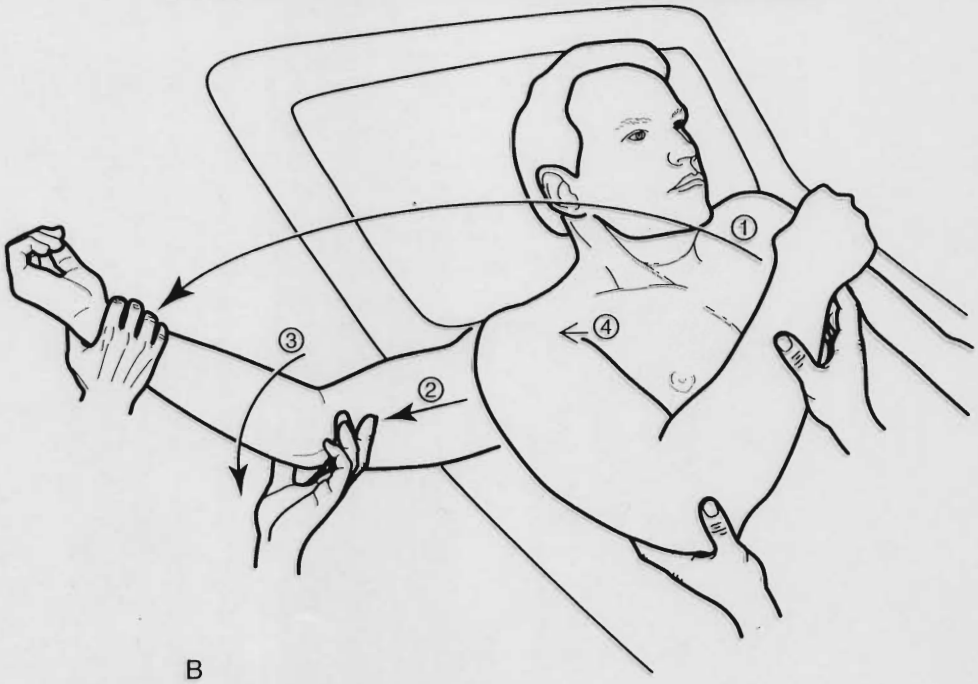
FIGURE 50–13. External rotation method. No traction is applied and a slow, gentle approach is essential. *A,* Arm is adducted to the patient's side. In one hand, the elbow is held flexed at 90° while the other hand grasps the wrist. *B,* Slowly and gently, the forearm is used as a lever to rotate the arm externally. *C,* Usually by the time the forearm has reached the coronal plane, the shoulder will have been reduced. (From Mirick MJ, Clinton J, Ruiz E: External rotation method of shoulder dislocation reduction. JACEP 8:529, 1979. Reproduced by permission.)

strength to provide continuous traction. Preferably, the elbow of the affected side is flexed to 90° and a sheet or strap is wrapped around the proximal forearm and then around the operator's back. The bed should be elevated to a point at which the sheet can sit at the level of the operator's ischial tuberosities. This allows the operator to comfortably lean back and use the body weight to supply the force of traction, eliminating the possibility of operator fatigue. The portion of the sheet that is positioned on the patient's forearm has a tendency to ride up; flexion of the elbow beyond 90° will minimize this problem. Alternatively, the operator merely leans backward with the arms fully extended, again using the continuous weight of the body rather than the strength of the biceps to provide constant traction.

Once traction is applied, the operator must be patient, as the procedure may take a number of minutes to be successful. Inadequate premedication is noted by the patient who resists the procedure or is notably uncomfortable during the reduction attempt. The operator should not hesitate to order supplementary medications. Gentle, limited external rotation is sometimes useful to speed reduction.[10] Applying traction to an arm that is slightly abducted from the patient's body is often successful, but some operators prefer to slowly bring the arm medial to the patient's midline while maintaining traction or to have an assistant apply a gentle lateral force to the midhumerus to direct the humeral head laterally. Successful reduction is usually presaged by slight lengthening of the arm as relaxation occurs, and a noticeable "clunk" may occur at the point of reduction. A brief fasciculation wave in the deltoid may also be seen at the time of reduction.

Spaso technique. This technique was first reported by Spaso Miljesic as a simple, single operator technique that requires minimal force.[33] One published series reported an 87.5% success rate among premedicated patients when performed by junior house officers.[34] The patient is placed in a supine position and the operator grasps the affected arm around the wrist or distal forearm. The affected arm is gently lifted vertically toward the ceiling, applying gentle vertical traction. While continuing to maintain traction, the arm is externally rotated (Fig. 50–16). Reduction may be subtle, but is generally signaled by hearing or feeling a "clunk." Completion of this technique may require several minutes of gentle traction, allowing the muscles of the patient's shoulder to relax.[34]





B

FIGURE 50–14. *A*, Milch technique. Slow, steady abduction with overhead-traction, external rotation (not shown), and direct pressure over the humeral head are the steps of the Milch technique. The procedure may take 3 to 4 minutes to complete, and the operator should avoid sudden, jerky manipulations. It may help to ask the patient to make a motion as if he or she is reaching up and picking an apple from a tree. *B*, The Milch method diagrammed: reduction of an anterior shoulder dislocation includes *(1)* abduction and external rotation, and *(2)* slow and steady gentle traction. When reduced, the arm is adducted *(3)*. Pressure to the humeral head with the operator's hand during traction *(4)* may aid the reduction.

Other methods. Poulsen reported a method termed the *Eskimo technique*, which may be performed in field settings. In this technique, the patient lies on the unaffected side and is lifted a short distance off the ground by grasping the abducted arm of the injured side. The patient's body weight acts to effect the reduction. Poulsen's success rate was 74% in a series of 23 patients, all of whom were premedicated.[35] Poulsen also postulated that this technique could place undue stress on the brachial plexus or axillary vessels. Use of this technique, when other options are available, should probably be reserved until a larger experience is reported.

Noordeen and associates reported a simple method in which the patient sits sideways in a chair, with the affected arm draped over the backrest. The operator holds the arm with the wrist supinated, and the patient is instructed to stand up. The success rate was 72% in 32 patients treated in this manner.[36] A variation of the chair technique, which was successful in 97% of 188 anterior shoulder dislocations, involves operator-applied traction to the patient's flexed elbow by means of a cloth loop or stockinette.[37] While standing beside the patient, the operator supports the involved elbow, holding the cloth loop in 90° of flexion while stepping down on the cloth loop. The patient sits in the chair, and an assistant may help support the patient by applying countertraction under the involved arm.

Waldron described a technique, without detailing the success rate, which is essentially a reverse of the Stimson method. The patient is placed supine, the affected arm is forward flexed to 90° and upward traction is applied to the distal humerus with the support of the epicondyles. The elbow is allowed to flex passively, and gentle internal and external rotation is applied through an arc of 20° total.[38]

Postreduction Care

After an attempt at reduction, the neurovascular status of the affected extremity should be rechecked and the results documented on the patient record. Indirect evidence that the reduction has been successful includes an immediate reduction

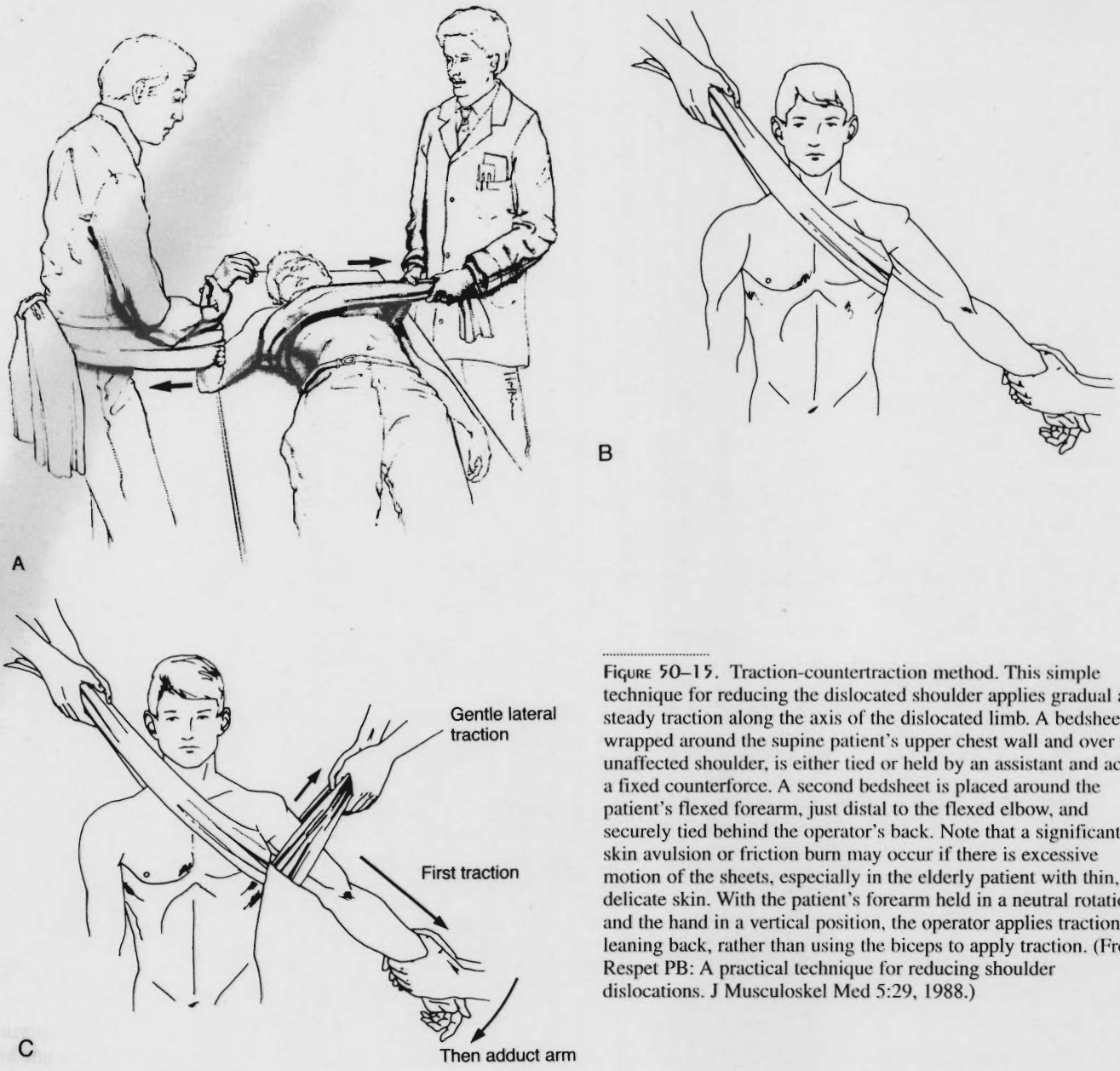


FIGURE 50–15. Traction-countertraction method. This simple technique for reducing the dislocated shoulder applies gradual and steady traction along the axis of the dislocated limb. A bedsheet, wrapped around the supine patient's upper chest wall and over the unaffected shoulder, is either tied or held by an assistant and acts as a fixed counterforce. A second bedsheet is placed around the patient's flexed forearm, just distal to the flexed elbow, and securely tied behind the operator's back. Note that a significant skin avulsion or friction burn may occur if there is excessive motion of the sheets, especially in the elderly patient with thin, delicate skin. With the patient's forearm held in a neutral rotation and the hand in a vertical position, the operator applies traction by leaning back, rather than using the biceps to apply traction. (From Respet PB: A practical technique for reducing shoulder dislocations. J Musculoskel Med 5:29, 1988.)

in pain, restoration of the round shoulder contour, and increased passive mobility of the shoulder. No harm is done by putting the joint through a limited range of motion. If the patient can tolerate placement of the palm from the injured arm on the opposite shoulder, it is quite likely that the shoulder reduction was successful (Fig. 50–17).

Postreduction radiographs are often recommended, with a careful search for new fractures. Although most greater tuberosity fractures do not alter patient management, patients with greater tuberosity fractures displaced > 1 cm after closed reduction are almost always associated with a rotator cuff tear,[39] and should receive prompt orthopedic consultation, as they may require operative repair.

It is important to prevent further external rotation or abduction of the reduced shoulder; adequate immobilization can be obtained by a commercially available shoulder immobilizer or a sling and swath (see Chapter 51). Orthopedic follow-up is recommended for all anterior shoulder dislocations. The incidence of rotator cuff injury is as high as 38%[40] and may complicate restoration of normal function. Younger patients will generally be immobilized for approximately 3 weeks and can be instructed to follow up within 1 or 2 weeks of the event. The older the patient, the shorter the time of immobilization.[10] Those older than 60 years should have early follow-up (5 to 7 days) to allow for early mobilization and avoidance of shoulder joint stiffness.

It is appropriate to prescribe oral analgesics (either nonsteroidal antiinflammatory drugs or narcotics) appropriate for the amount of patient discomfort at the time of disposition and to instruct the patient to return for any worsening of the clinical condition. Periodically one may encounter a return visit from a successfully treated patient who is in severe pain from a hemarthrosis. Trimmings reported excellent relief of pain by aspiration of the hemarthrosis 24 to 48 hours

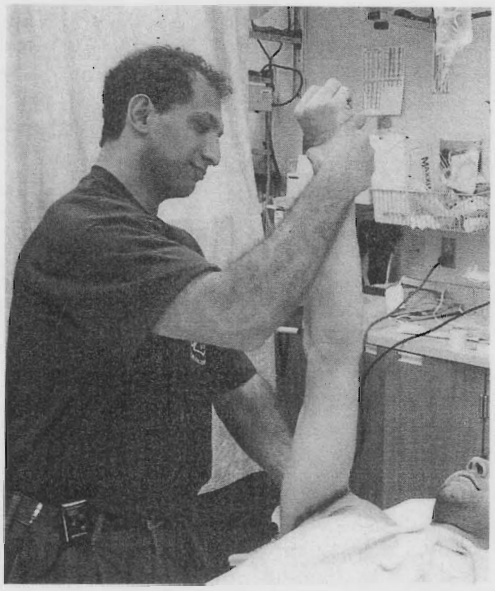


FIGURE 50–16. Spaso technique. While maintaining gentle vertical traction, the affected arm is externally rotated by grasping the wrist or forearm. Reduction may be subtle.

after shoulder reduction in a series of patients older than 60 years.[41] This can be accomplished using the technique of arthrocentesis described in Chapter 54. In addition, intra-articular instillation of 10 to 20 mL of 1% lidocaine as has been recommended for shoulder reduction may be helpful for further pain relief.

Posterior Shoulder Dislocations

Posterior shoulder dislocations account for less than 4% of all shoulder dislocations.[12] Because they are so uncommon, posterior dislocations are easily overlooked and the emergency clinician must be knowledgeable about these injuries to avoid a misdiagnosis. Delays in diagnosis for weeks to months have been reported with posterior dislocations.[42, 43] This may lead to increased rates of dislocation arthropathy and chronic pain.[13] The mechanism of injury is almost always indirect, with a combination of internal rotation, adduction, and flexion.[10] *Classic precipitating events include seizure, electrical shock, and falls.* The patient may also present at a point well past the original event.[43] Patients with seizures may not experience obvious problems in the immediate postictal period due to their altered mental status.

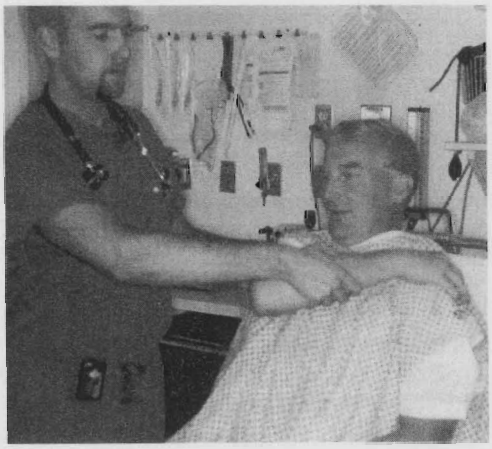


FIGURE 50–17. If a patient with a shoulder injury can place the palm of the injured arm on top of the contralateral shoulder, it is unlikely that a shoulder dislocation is present. Alternatively, completion of this maneuver after a reduction attempt provides strong evidence that the reduction was successful.

Clinical Assessment

While clinically less obvious than anterior dislocations, posterior shoulder dislocations do present in a typical, recognizable manner. Mistakes may be made if the clinician is overly reliant on the AP radiographs, which are potentially misleading,[43] and may result in misdiagnosing the injury as a soft tissue contusion or acromioclavicular (AC) strain. *The principal sign of posterior dislocation is an arm that is somewhat fixed in adduction and internal rotation.* Abduction and external rotation are limited, and attempts to perform these movements generally elicit pain (Fig. 50–18).[10, 12] Inspection and palpation reveal a loss of the normal anterior contour of the shoulder and a prominent coracoid and acromion. The shoulder is flattened anteriorly and rounded posteriorly, where the humeral head may be palpable.[10, 12]

Comparison to the opposite shoulder should be undertaken with the understanding that this injury may occasionally occur bilaterally. Neurovascular assessment is performed in the standard manner, although such complications are unusual with posterior dislocations.

Radiologic Examination

The key point regarding radiographs for posterior shoulder dislocations is the subtle nature of this dislocation on a single AP radiograph (Fig. 50–19*A* and *B*) and the diagnostic value of the scapular Y view (Fig. 50–19*C*) or the axillary view (Fig. 50—19*C*). The diagnosis of posterior shoulder dislocation using the axillary view is quite easy, whereas the routine AP and lateral views are difficult to interpret in around half of cases.[43] The axillary view is generally available in the radiology department and can be obtained with as little as 20–30° of abduction, with the plate placed on the shoulder.[43] In addition to easy visualization of the *posteriorly* situated humeral head, the axillary view often reveals an impression fracture of the humeral head (Fig. 50–19*D*). The humeral head is *anterior* to the glenoid.

Whereas the axillary view is diagnostic, clues to posterior dislocation do exist on the AP film. The internally rotated humeral head appears symmetrical on the AP film in the shape of a light bulb as opposed to the normal club-shaped appearance created by the greater tuberosity.[44] With posterior dislocation, the space between the articular surface of the humeral head and the anterior glenoid rim is widened, and there is a decrease in the half-moon–shaped overlap of the head and the fossa (Figs. 50–20 and 50–21).[42, 44] There may also be a compression fracture of the medial aspect of the humeral head, indicated by a dense line. This is known as the "trough" sign.[44] A fracture of the lesser tuberosity should always prompt a search for the presence of a posterior shoulder dislocation.[42]

Reduction Technique

An acute posterior dislocation may be reduced by traction on the internally rotated and adducted arm combined with posterior pressure on the humeral head (Fig. 50–22).[10, 43]

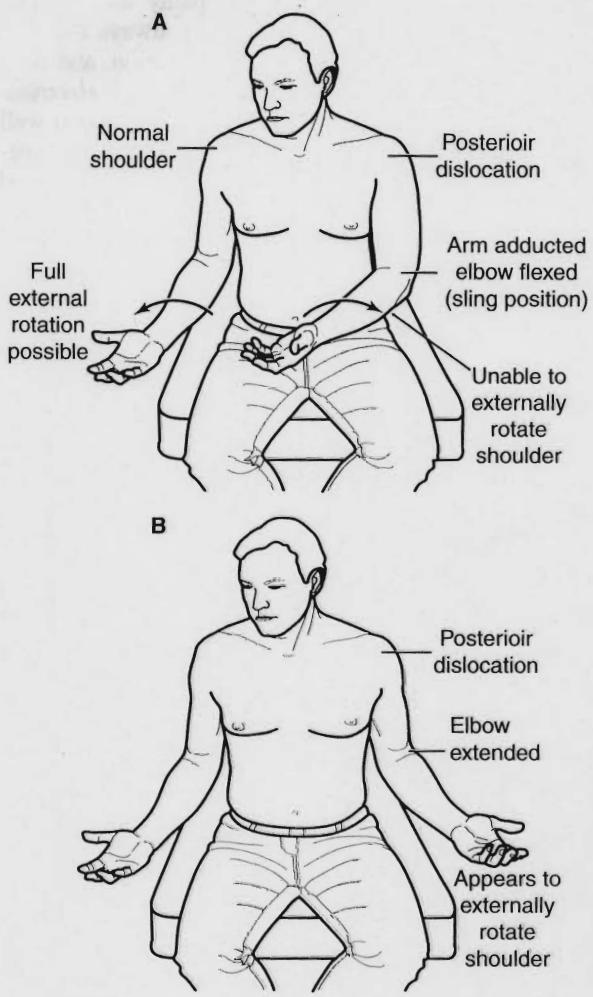


FIGURE 50–18. *A*, A clue to a posterior shoulder dislocation is the arm locked in adduction and internal rotation, with patient's inability to rotate the shoulder externally with the elbow flexed at 90°. *B*, Note that extension of the elbow with supination of the forearm may obscure loss of the external rotation.

Premedication is generally indicated (see Chapter 34) and countertraction may be applied with a sheet looped in the affected axilla much as described for anterior dislocations. Rockwood and Wirth recommend applying lateral traction on the upper humerus if the humeral head is locked on the posterior glenoid.[10] Hawkins and coworkers suggest that posterior dislocations with an impression defect of the humeral head that is greater than 20% of the articular surface require open reduction.[43] Posterior dislocations that have been diagnosed late are difficult to reduce in a closed manner, but an attempt with adequate premedication is generally indicated.[43]

Postreduction Care

As with anterior dislocations, a repeat neurovascular examination and radiographs are obtained after reduction attempts. As before, the patient's ability to place the palm of the injured arm on the opposite shoulder is suggestive of a successful reduction. Given the rarity of these injuries, orthopedic consultation is often sought early in the care of these patients. Certainly in a training environment, involvement of an orthopedic resident benefits his or her education and should be considered early on. After successful reduction, immobilization with application of a "hand-shake" cast in neutral rotation and slight extension is indicated (Fig. 50–23).[10] This relaxes the injured structures to allow healing.

Unusual Shoulder Dislocations

Inferior dislocations of the shoulder, known as *luxatio erecta*, are quite rare, but also quite obvious. The patient presents with the arm locked in marked abduction with the flexed forearm lying on or behind the head.[45] Occasionally, the humerus may have less abduction, thus potentially obscuring the diagnosis.[46] The humeral head can be palpated along the lateral chest wall. Neurovascular compression may be present, but this is usually reversed once reduction is accomplished.[10] Overhead traction (generally with the arm in full abduction) is applied in the longitudinal direction of the arm and cephalad pressure can be exerted over the humeral head much as in the Milch technique.[10, 46] Countertraction toward the patient's feet can be applied using a sheet placed over the injured shoulder. After reduction, the abducted arm is brought into adduction against the body and the forearm supinated.[47]

Scapular dislocation or "locked scapula" is a rare condition that presents with an obvious protrusion of the lateral border of the scapula and significant swelling of the medial border due to tearing of the musculature.[48] Reduction is accomplished by traction on the abducted arm and medial pressure on the scapula.[48]

ACROMIOCLAVICULAR SUBLUXATION AND DISLOCATIONS

The AC joint is a true diarthrodial joint with a synovial cavity surrounded by a relatively lax capsule and the weak AC ligament. This structure allows for the gliding motion necessary for shoulder movement. The major stability of the AC joint comes from the coracoclavicular ligament, which has posterior (conoid) and anterior (trapezoid) components. The mechanism of injury is generally from a direct force such as a fall on the point of the shoulder with the arm adducted.[49] There are six grades of injury to the AC joint; they are classified by degree or type (I through VI) (Fig. 50–24).

First degree (type I). This injury consists of a minor tear in the AC ligament. The coracoclavicular ligament is intact. The clinical findings are limited to tenderness in the area of the AC joint. Radiographs show little if any change in the position of the clavicle in relation to the acromion.[39] The management of this condition consists of a sling for comfort, ice, and mild analgesics. Generally, symptoms subside with 7 to 10 days of rest.[10] Orthopedic referral is generally not necessary unless return to normal function is delayed beyond 2 weeks.

Second degree (type II). In addition to a complete tear of the AC ligament, the coracoclavicular ligament is stretched or incompletely torn.[39] The patient generally supports the injured arm and has slight swelling and definite tenderness over the AC joint. Radiographs demonstrate a definite change in the relationship of the distal clavicle to the acromion.

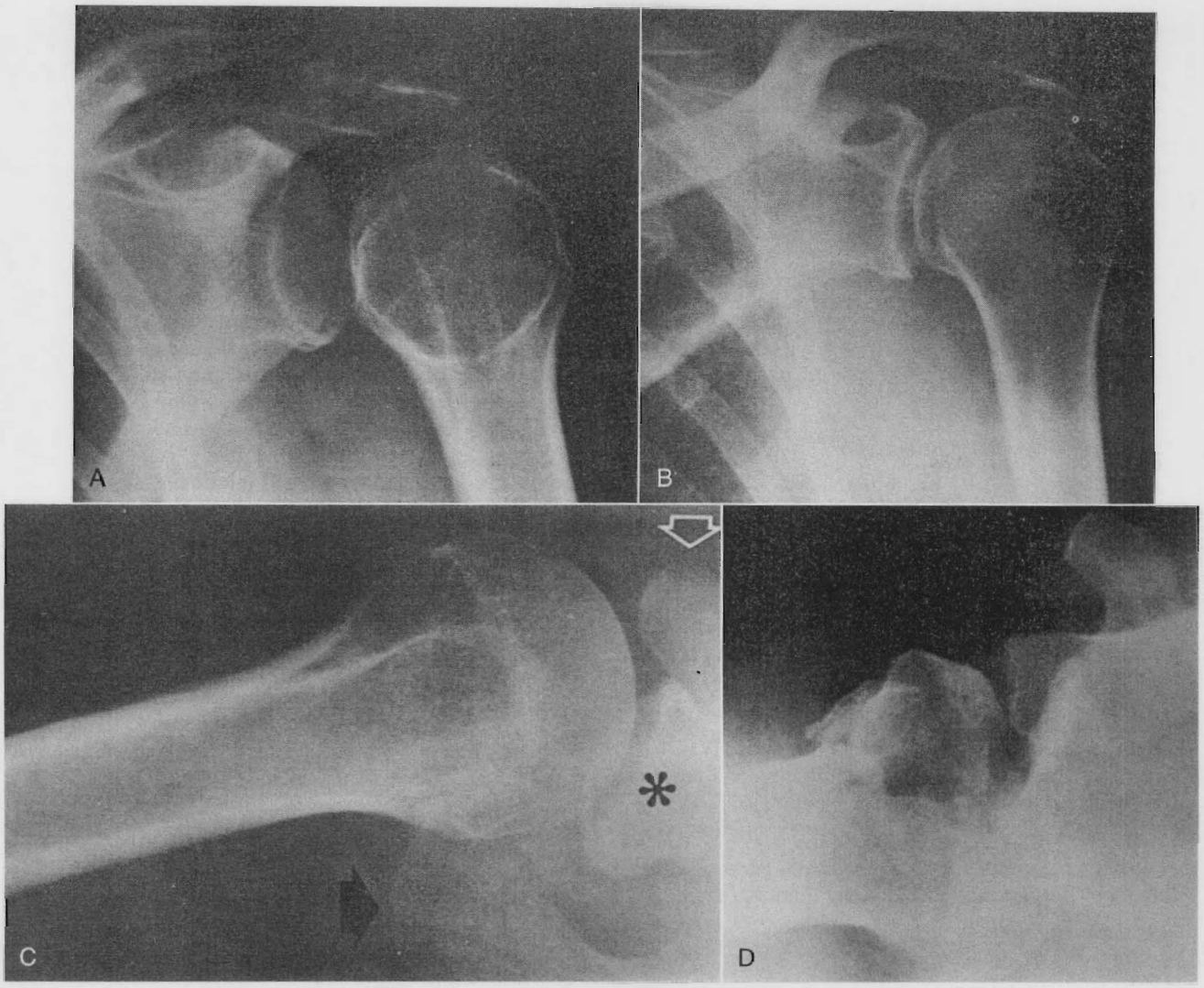


Figure 50–19. *A,* This patient has a posterior dislocation of the humerus. Because the dislocation is directly posterior, there is no superior or inferior displacement of the humeral head. On superficial observation, the head of the humerus appears to maintain a normal relationship with the glenoid fossa and the acromion process. However, definite abnormalities exist in this film. The space between the humeral head and the glenoid fossa is abnormally wide, and because of the extreme internal rotation of the humerus, the head and neck are seen end on. In this projection, the humeral head resembles a light bulb. Compare this film with the same patient's normal opposite shoulder (note that the film is reversed for illustrative purposes) *(B). C,* The normal axillary view of the shoulder. The *asterisk* indicates the glenoid process. The *open arrow* indicates the coracoid process of the scapula and the *closed arrow* indicates the acromion process of the scapula. *D,* Axillary view of a posterior shoulder dislocation with an impression fracture of the humeral head. (From Harris JH, Harris WH (eds): The Radiology of Emergency Medicine. Baltimore, Williams & Wilkins, 1971.)

However, in type II injuries, the inferior edge of the clavicle should not be separated from the acromion by more than one-half its diameter,[39] and on radiographic examination, the coracoclavicular distance is the same as the uninjured side.[10] This injury can be treated in a closed fashion with a sling.[10] Orthopedic referral is recommended, and some will use a sling-strap device that elevates the arm and depresses the clavicle for these injuries.[39]

Third degree (type III). In this injury, the distal end of the clavicle is essentially free floating, as both the AC and coracoclavicular ligament are completely disrupted.[39] The arm is supported by an uncomfortable patient and the distal clavicle is usually seen to be riding high above the acromion. The diagnosis is generally obvious, and radiographs are mainly used to rule out an associated fracture. Radiographic criteria for this degree of injury include an inferior border of the clavicle above the acromion, or a discrepancy in the coracoclavicular distance as compared with the normal side.[10] These injuries require orthopedic referral, and a fair bit of controversy exists regarding their subsequent management.[10] Larsen and colleagues conducted a prospective, randomized trial of conservative vs operative management for significant AC separations and concluded that conservative management was generally better, with possible exceptions made for patients with significant cosmetic deformity and for those who frequently keep the arm at 90° of abduction.[50] While optimal therapy is still unclear, a logical approach would include ED treatment with a sling and early orthopedic referral.

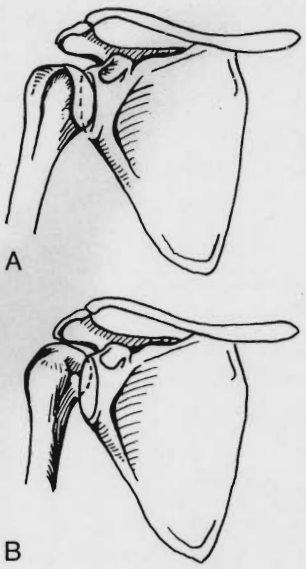


FIGURE 50–20. *A,* Note the normal elliptical pattern of overlap produced by the head of the humerus and the glenoid fossa. *B,* In the patient with a posterior dislocation, this pattern is lost, and internal rotation of the greater tuberosity is also noted. (From Simon R, Koenigsknecht S: Orthopedics in Emergency Medicine. New York, Appleton-Century-Crofts, 1982, p 344. Reproduced by permission.)

Fourth, fifth, and sixth degree (type IV to VI). In type IV injury, the distal clavicle is free floating and posteriorly displaced into the mass of the trapezius muscle. Type V injury is characterized by inferior displacement of the scapula with a marked increase (two to three times normal) in the coracoclavicular interspace.[10] Type IV and V dislocations generally require surgery, and orthopedic referral is required. Type VI injury involves dislocation of the distal clavicle inferiorly. Because this is usually the result of major trauma, multiple other fractures are often seen.[10]

Radiographic Examination

The diagnosis is usually made clinically, with pain and local tenderness at the AC joint in the absence of other findings. Radiographs are generally indicated to rule out associated fractures and to aid in assessing the degree of injury. A single radiograph of the injured shoulder often suffices, but some clinicians prefer to obtain comparison views of the opposite shoulder. While their efficacy has never been proven, it has been traditionally recommended that "weighted" films be obtained in suspected type I or II injuries. Weighted films are generally performed after routine "unweighted" radiographs and are obtained by strapping about 4.5 to 7.0 kg (10 to 15 lb) of weight to the patient's wrists and repeating the radiographs. It is important that the patient keep the shoulders as relaxed as possible during this study, and the patient should not be asked to hold the weights (rather, they are strapped to the wrists). As expected, this study may cause significant discomfort for the patient. Weighted films are of questionable value in mild injuries, and superfluous in obvious type III to VI injuries.

The value of comparison views as well as weighted films may remain controversial by some authors,[51] but their use has been essentially abandoned in current day practice. Bossart and others examined the routine use of "weighted" studies of

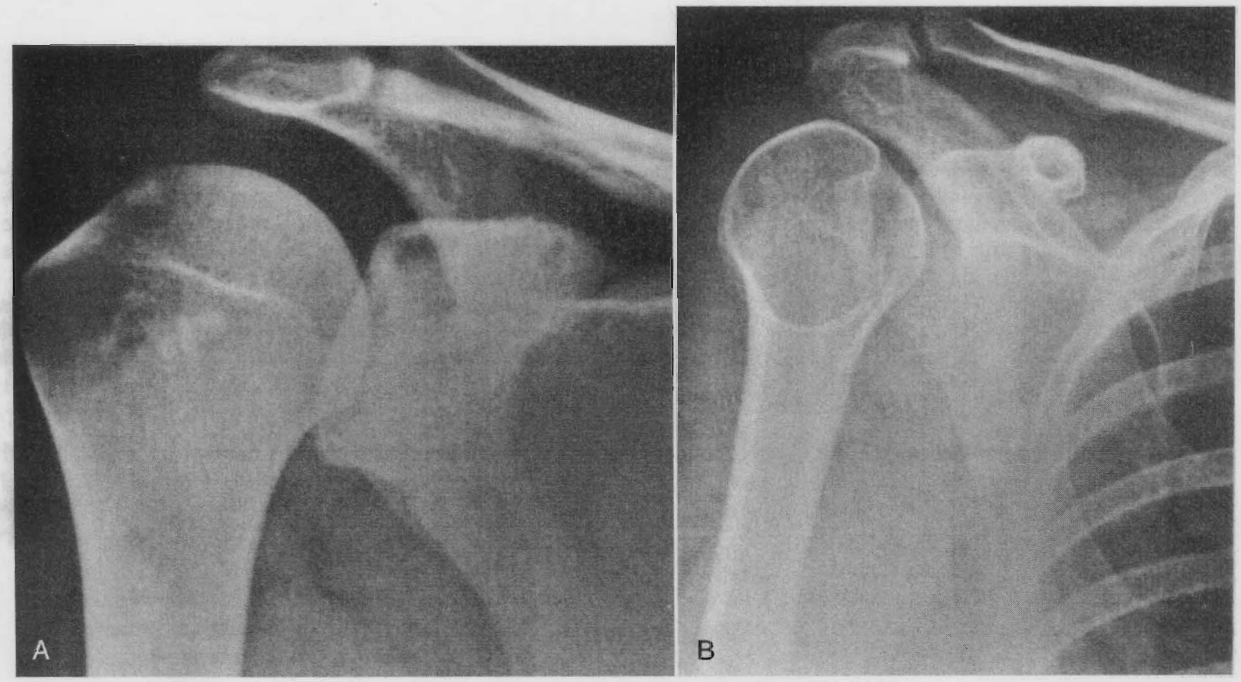


FIGURE 50–21. Posterior dislocation of the humeral head is a subtle, easily missed finding on the anteroposterior view. A key finding is an abnormal overlap of the humeral head with the glenoid fossa, but additional views are usually needed to confirm the dislocation. Comparison with the normal shoulder may also help. *A,* This AP film showing a posterior dislocation was initially read as normal, but the dislocation was obvious on an axillary view (see Fig. 50–19). *B,* "Light-bulb" appearance of the humeral head in a posterior dislocation. Posterior dislocation should be suspected in patients with significant pain and dysfunction after trauma, especially following seizures and electrical shock injuries. Occasionally the dislocations are bilateral. (From Riddervold HO: Easily Missed Fractures and Corner Signs in Radiology. Mt Kisco, NY, Futura, 1991.)

FIGURE 50–22. Reduction of posterior shoulder dislocation—with countertraction being applied, traction on the internally rotated and adducted arm is combined with posterior pressure on the humeral head to effect reduction.

the AC joints and recommended abandoning their use in the ED.[52] In a prospective study of 70 type I or II injuries, the use of weights was associated with *less evident separation* in 7 cases, essentially producing a false-negative study compared to plain unweighted films. Only three injuries were re-categorized as type III after the performance of weighted films.[52] This yield is not necessarily inconsequential if subsequent management would entail a change in therapy for these three patients. However, Bossart and colleagues noted that surgery is often not recommended with type III injuries.[52] For the majority of cases, the editors consider weighted radiographs unnecessary, but they may be helpful for athletes or in other selected cases. When in doubt, consultation with the referring orthopedic surgeon is advised.

STERNOCLAVICULAR DISLOCATIONS

Despite the fact that the sternoclavicular joint is the least stable joint in the body, sternoclavicular dislocations are rare.[53] The primary supports of this joint are the sternoclavicular and costoclavicular ligaments. Anterior dislocations are much more common and are usually the result of an indirect mechanism involving a blow thrusting the shoulder forward,[39]

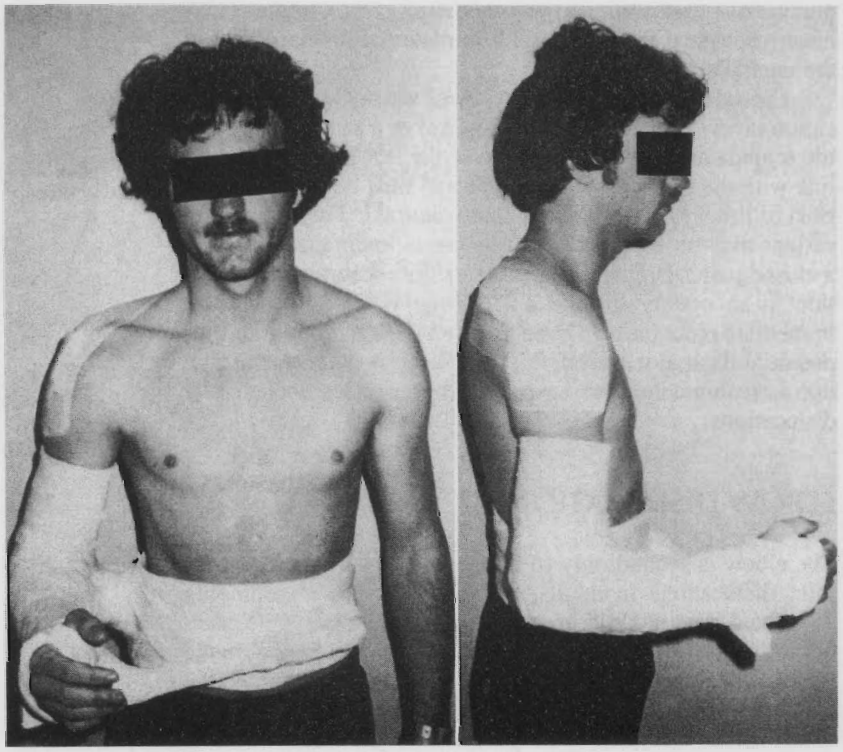


FIGURE 50–23. Handshake cast—after successful reduction of an acute posterior shoulder dislocation, this cast is applied in neutral rotation, slight extension, and 15 to 20 degrees of abduction. (From Rockwood CA, Wirth MA: Subluxations and Dislocations about the Glenohumeral Joint. In Rockwood CA, Green DP, Bucholz RW, et al (eds): Rockwood and Green's Fractures in Adults, vol 2, 4th ed. Philadelphia, Lippincott-Raven, 1996, p 1291. Reproduced by permission.)